CLMPTO

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1. (Currently Amended) A process for combined thermal and catalytic treatment of heavy petroleum in a slurry phase counterflow reactor, which process comprises:

a) introducing a liquid feedstock at a top of a reactor vessel to a gas phase thermal reaction zone and thermally reacting said liquid feedstock;

b) injecting a gas comprising hydrogen near a bottom of said reactor vessel in a catalytic reaction zone;

c) passing said liquid from said gas phase thermal reaction zone to a liquid phase thermal reaction zone in said reactor vessel below and in communication with said gas-phase thermal reaction zone and thermally reacting said reacted liquid therein;

d) passing said reacted liquid from said liquid phase thermal reaction zone to a catalytic reaction zone below said liquid phase thermal reaction zone and <u>hydrogenating</u> ~~chemically reacting~~ said reacted liquid therein; and

e) dispersing said hydrogen through said catalytic reaction zone, through said liquid phase thermal reaction zone and through said gas-phase zone and thereafter separating said hydrogen along with gaseous hydrocarbon products from said thermal and chemical reactions.

2. (Original) A process for combined thermal and catalytic treatment as set forth in Claim 1 including the additional steps of:

withdrawing heavy unconverted residual product from said bottom of said reactor vessel;

directing at least a portion of said heavy residual product removed to a catalyst addition system having a buffer tank; and

introducing catalyst to said reactor vessel from said catalyst addition system to said catalytic reaction zone.

3. (Currently Amended) A process for combined thermal and catalytic treatment as set forth in Claim 1 wherein said hydrogen gas is injected ~~dispersed by injecting~~ into said reactor vessel at said catalytic reaction zone and ~~bubbling~~ said hydrogen gas is dispersed through said vessel.

4. (Currently Amended) A process for combined thermal and catalytic treatment as set forth in Claim 1 wherein said hydrogen gas is injected at a temperature exceeding the temperature of said catalytic reaction zone~~hot~~.

5. (Original) A process for combined thermal and catalytic treatment as set forth in Claim 1 including the additional step of encouraging mixing of said liquid in said liquid phase thermal reaction zone through the use of a plurality of vertical baffles.

6. (Currently Amended) A process for combined thermal and catalytic treatment as set forth in Claim 1 including the additional step of filtering said withdrawing hydrogen gas with gaseous hydrocarbon ~~hydrogen~~ product through a filter to remove solids.

7. (Currently Amended) A process for combined thermal and catalytic treatment as set forth in Claim 1 including the additional step of detecting ~~a liquid level detector to monitor~~ the level of said liquid in said liquid phase thermal reaction zone in said reactor vessel.

8. (Original) A process for combined thermal and catalytic treatment as set forth in Claim 1 including the additional, initial step of passing said liquid feedstock in heat exchange with said withdrawing hydrogen gas and hydrocarbon product to heat said liquid feedstock.

9. (Original) A process for combined thermal and catalytic treatment as set forth in Claim 1 wherein said step of introducing liquid feedstock to a top of a reactor vessel is below a porous metal filter screen.

10. (Original) A process for combined thermal and catalytic treatment as set forth in Claim 1 wherein said step of introducing liquid feedstock at said top of said reactor vessel is through a nozzle.

11. (Original) A process for combined thermal and catalytic treatment as set forth in Claim 1 including the additional step of separating said withdrawn hydrogen gas from said gaseous hydrocarbon product and recirculating through said catalytic zone.

12. (Original) A process for combined thermal and catalytic treatment as set forth in Claim 1 including controlling and monitoring pressure by a pressure let down system.

13. (Original) A process for combined thermal and catalytic treatment as set forth in Claim 1 wherein pressure in said reactor vessel is maintained at 1500-2000 PSIG and temperature is maintained at 450^0F-850^0F.

Claims 14-18 has been cancelled.